2012

Karnaphuli River-Life Recreation & Research Center, Chittagong, Bangladesh

Hosne A. Sufian
University of Massachusetts Amherst

Follow this and additional works at: https://scholarworks.umass.edu/theses

Part of the Architecture Commons

Retrieved from https://scholarworks.umass.edu/theses/954

This thesis is brought to you for free and open access by ScholarWorks@UMass Amherst. It has been accepted for inclusion in Masters Theses 1911 - February 2014 by an authorized administrator of ScholarWorks@UMass Amherst. For more information, please contact scholarworks@library.umass.edu.
KARNAPHULI RIVER-LIFE RECREATION & RESEARCH CENTER,
CHITTAGONG, BANGLADESH

A Thesis Presented

by

HOSNE ARA SUFIAN

Submitted to Graduate School of the University of Massachusetts
In partial fulfillment of the requirements for the degree of

MASTER OF ARCHITECTURE
September 2012

Architecture+ Design program
Department of Art, Architecture & Art History
KARNAPHULI RIVER-LIFE RECREATION & RESEARCH CENTER,
CHITTAGONG, BANGLADESH

A Thesis Presented

by

HOSNE ARA SUFIAN

Approved as to style and content by:

________________________________
Kathleen Lugosch – Chair

________________________________
Sigrid Miller Pollin – Member

________________________________
Kathleen Lugosch
Graduate Program Director
Architecture+Design Program
Department of Art, Architecture, and Art History

________________________________
William T. Oedel
Chair, Department of Art, Architecture, and Art History
ACKNOWLEDGEMENTS

I would like to thank my thesis committee and my professors who guided and accompanied me throughout my entire thesis process. It would not have been possible to come up with a successful thesis without their inspirations, suggestions and appreciations. A sincere gratitude goes to all individuals who facilitated me with all necessary information and documents required for establishing this thesis.
ABSTRACT

KARNAPHULI RIVER-LIFE RECREATION & RESEARCH CENTER

CHITTAGONG, BANGLADESH

SEPTEMBER 2012

HOSNE ARA SUFIAN

M.Arch, University of Massachusetts Amherst

Directed By: Professor Kathleen Lugosch

Rivers are integral parts of Bangladesh & Bengali people’s life. The whole country is criss-crossed by more than 700 rivers including their tributaries. In other words, rivers formed this country as a delta and have been contributing to spring life to this land with agriculture, food, electricity, transportation, and tranquil beauty, creating opportunity for different occupations, and providing very comfortable moderate climate. Due to over population and urban sprawl, the current development pattern of the country is culminating in filling up wetlands, changing the course of lakes, narrowing down and in some cases killing rivers for urban development leaving great impact on environment. As a consequence, the country is being affected by frequent flood, deforestation, surge, cyclones, and rise of sea level due to global warming. The concern for introducing an adoptive sustainable architecture that interacts with rivers and water, protects environment as well as facilitates new developments has been noticed by scientists and scholars from every sector of development. This thesis will be emphasizing on establishing some unique architectural features that would especially be applicable for riverfront architectures that leaves least impact on nature and respects the country’s tradition, heritage and lifestyle which are inseparable from rivers.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter/Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>ABSTRACT</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>viii</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1. THESIS INTENT</td>
<td>1</td>
</tr>
<tr>
<td>Thesis Objective</td>
<td>2</td>
</tr>
<tr>
<td>2. RIVERS OF BANGLADESH</td>
<td>4</td>
</tr>
<tr>
<td>Rivers: Characteristic of Land</td>
<td>4</td>
</tr>
<tr>
<td>Rivers: In Origin &amp; Existence</td>
<td>5</td>
</tr>
<tr>
<td>Rivers: As Source of Life</td>
<td>6</td>
</tr>
<tr>
<td>Occupation</td>
<td>6</td>
</tr>
<tr>
<td>Transportation</td>
<td>7</td>
</tr>
<tr>
<td>Tradition &amp; Culture</td>
<td>8</td>
</tr>
<tr>
<td>Joy of life</td>
<td>8</td>
</tr>
<tr>
<td>Art &amp; Craft</td>
<td>9</td>
</tr>
<tr>
<td>Cultural Preservation</td>
<td>9</td>
</tr>
<tr>
<td>Beauty &amp; Tourism</td>
<td>9</td>
</tr>
<tr>
<td>Rivers: In Devastation</td>
<td>10</td>
</tr>
<tr>
<td>3. EXISTING RIVERSIDE DEVELOPMENT</td>
<td>11</td>
</tr>
<tr>
<td>4. INFLUENCE OF WATER IN ARCHITECTURE</td>
<td>13</td>
</tr>
<tr>
<td>Reflection</td>
<td>13</td>
</tr>
<tr>
<td>Integration of Architecture, human and water</td>
<td>14</td>
</tr>
<tr>
<td>In Land Construction</td>
<td>15</td>
</tr>
<tr>
<td>Edge Construction</td>
<td>15</td>
</tr>
</tbody>
</table>
5. PRECEDENT STUDY ...................................................................................................................... 17
   The Randers Museum of Art ........................................................................................................ 17
   Natalie Jeremijenko ’S Ooz (Zoo) .............................................................................................. 20
   Jean Marie Tjibaou Cultural Center ............................................................................................ 23
   Thesis Development Phase- 2 ...................................................................................................... 26

6. THE SITE ....................................................................................................................................... 27
   Location ...................................................................................................................................... 27
   Site Surrounding .......................................................................................................................... 28
   Communication & Circulation ...................................................................................................... 29
   Land Use Pattern ........................................................................................................................ 30
   Site Images .................................................................................................................................. 31
   Special Characteristic: Tidal Creeks ............................................................................................ 32
   Site Section ................................................................................................................................... 34
   Climate ......................................................................................................................................... 34
   Floods in different season ............................................................................................................ 35

7. PROGRAM ..................................................................................................................................... 36
   Built Area ..................................................................................................................................... 36
   Outdoor Recreation Facilities ...................................................................................................... 37
   Laboratories ................................................................................................................................. 37

8. BUILDIGN SYSTEM RESEARCH ................................................................................................. 39
   Structural ..................................................................................................................................... 39
   Rain Water Storage System ........................................................................................................ 39
   Material: Vernacular Architecture ............................................................................................. 40
   Construction Technique: Anta- Fish Trap .................................................................................... 40
   Local Precedent Study: Nishorgo Oirabot Nature Interpretation Center ................................. 41
   Final Design Development .......................................................................................................... 42

9. DESIGN PROPOSAL ..................................................................................................................... 43
   Design concept ............................................................................................................................ 43
Preliminary Design ......................................................................................................................... 46
Final Design Documentation ........................................................................................................... 47
  Site Plan ........................................................................................................................................ 50
  Details .......................................................................................................................................... 55
Thesis Presentation Boards .............................................................................................................. 59

BIBLIOGRAPHY .............................................................................................................................. 61
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Thesis Intent Diagram</td>
<td>2</td>
</tr>
<tr>
<td>2: Thesis Objective Diagram</td>
<td>3</td>
</tr>
<tr>
<td>3: The Rivers &amp; their tributaries</td>
<td>4</td>
</tr>
<tr>
<td>Source: <a href="http://www.bpedia.org/R_0207.php">http://www.bpedia.org/R_0207.php</a></td>
<td></td>
</tr>
<tr>
<td>4: River revealing land in summer</td>
<td>5</td>
</tr>
<tr>
<td>5: Himalayas: The origin of Ganges</td>
<td>5</td>
</tr>
<tr>
<td>6: Bay of Bengal: The discharge</td>
<td>5</td>
</tr>
<tr>
<td>7: Rivers in life and lifestyle</td>
<td>6</td>
</tr>
<tr>
<td>8: Ship breaking yard in Chittagong</td>
<td>6</td>
</tr>
<tr>
<td>Source: <a href="http://www.lightstalkers.org/images/show/588712">http://www.lightstalkers.org/images/show/588712</a></td>
<td></td>
</tr>
<tr>
<td>9: Fishing</td>
<td>7</td>
</tr>
<tr>
<td>10: Fishing and sailing</td>
<td>7</td>
</tr>
<tr>
<td>11: Fishing</td>
<td>7</td>
</tr>
<tr>
<td>Source: <a href="http://www.nowpublic.com/world/fishing-0">http://www.nowpublic.com/world/fishing-0</a></td>
<td></td>
</tr>
<tr>
<td>12: Boats are common means of transportation in rural areas</td>
<td>8</td>
</tr>
<tr>
<td>13: Rural Children in rivers</td>
<td>8</td>
</tr>
<tr>
<td>Source: <a href="http://www.lightstalkers.org/images/show/588673">http://www.lightstalkers.org/images/show/588673</a></td>
<td></td>
</tr>
</tbody>
</table>
14: Fishing crafts in exhibition ................................................................. 9

15: Natural beauty of River ........................................................................ 10

16: Ruplal House ......................................................................................... 12

17: Ahsan Manjil ......................................................................................... 12

18: Development beside Turag River ........................................................... 12
    Source: http://www.thedailystar.net/newDesign/photo_gallery.php?pid=183267

19: Riverside slum in Dhaka city ................................................................. 12
    Source: http://commons.wikimedia.org/wiki/File:Riverside_slum_in_Bangladesh.jpg

20: Reflection of Sheikh Zayed Grand Mosque in Abu Dhabi ....................... 13

21: Reflection of Taj Mahal on Yamuna River, India. Taj Mahal was built by Mughol emperor Shah Jahan ................................................................. 14
    Source: http://www.blogg.org/blog-49156-themes-beaute_de_l_inde-100514.html

22: Reflection of nature on architecture: The Tree Hotel by Tham & Videgard Architect ........... 14
    Source: http://sfdesigngirl.wordpress.com/category/deezen/

23: Reflection of nature on architecture: International Garden Festival-Reford Gardens, Quebec by Hal Ingberg ........................................................................ 14
    Source: http://europaconcorsi.com/projects/17166-Coloured-Reflections

24: National Opera & Ballet in Oslo .............................................................. 15
    Source: http://ad009cdnb.archdaily.net/wpcontent/uploads/2008/05/11.jpg

25: Dike construction in Holland .................................................................. 15
    Source: http://riverowl71.wordpress.com/tag/holland/

26: Pirrama Park, Landscape design by Aspect Studios .................................. 16
27: Thesis Development Diagram-Phase 1 ........................................................................ 16
28: Randers Museum, site Context ..................................................................................... 18
   Source: http://www.3xn.dk/en/#/home/projects/projects_name/76989_randers_kunstmuseum
29: Randers Museum, Sculpture Garden ........................................................................... 18
   Source: http://www.3xn.dk/en/#/home/projects/projects_name/76989_randers_kunstmuseum
30: Randers Museum, reflection on water ........................................................................ 19
   Source: http://www.3xn.dk/en/#/home/projects/projects_name/76989_randers_kunstmuseum
31: Randers Museum, Relationship Diagram .................................................................... 19
32: Natalie Jeremijenko's proposed zoo ............................................................................. 21
   Source: http://ekistica.wordpress.com/2007/04/15/amphibious-architecture/
33: The proposed zoo on existing piers of Hudson River ................................................ 21
   Source: http://ekistica.wordpress.com/2007/04/15/amphibious-architecture/
34: Basic Components of zoo ........................................................................................... 21
   Source: http://ekistica.wordpress.com/2007/04/15/amphibious-architecture/
35: Relationship Diagram ................................................................................................ 22
36: Conceptual sketch by Renzo Piano .............................................................................. 24
   http://conceptskeen.tumblr.com/post/21429372412
37: Gallery Space ............................................................................................................... 24
   Source: http://www.designbuzz.com/entry/jean-marie-tjibaou-cultural-center-a-classic-example-of-green-architecture/
38: Site Context .................................................................................................................. 25
39: Circulation spaces ......................................................................................................... 25
   Source: http://www.designbuzz.com/entry/jean-marie-tjibaou-cultural-center-a-classic-example-of-green-architecture/
40: Relationship Diagram ................................................................................................ 25
41: Thesis Development Diagram-Phase 2 ......................................................................... 26
42: Chittagong City in Bangladesh
Source: http://en.wikipedia.org/wiki/Template:Location_map_Bangladesh

43: Proposed site & its surrounding
Source: http://maps.google.com/maps?hl=en&tab=ll

44: Third Kanaphuli Bridge

45: Old Kalurghat Bridge

46: Access to the site by boat

47: Circulation around the area

48: Proposed land use plan of DPZ-04 (Bakalia-Chandgaon)

49: Site Panoramic View 1

50: Site Panoramic View 2

51: Site Panoramic View 3

52: Tidal Creeks

53: Navigational Creek

54: Navigational Creeks in site

55: The Mouth of Creek from river

56: Swamp grass

57: Site Section

58: Sun-path diagram

59: Effect of tidal flood and monsoon flood

60: Float House in New Orleans by Morphosis Architects
Source: http://morphopedia.com/projects/float-house

61: Rainwater tanks filled in Chassis
Source: http://morphopedia.com/projects/float-house
83: Plans ................................................................................................................................. 52
84: Types of Platform .................................................................................................................. 53
85: Section through research area .................................................................................................. 53
86: Transverse Section .................................................................................................................... 53
87: Section through Library & Gallery ............................................................................................. 53
88: Platforms ....................................................................................................................................... 54
89: Shell ............................................................................................................................................... 54
90: Special relationship ....................................................................................................................... 54
91: Movement of floating deck with rise of water .............................................................................. 55
92: Floating and inundated platforms ................................................................................................. 56
93: Diagram of Rainwater collection system ....................................................................................... 56
94: Floating ramp detail ...................................................................................................................... 56
95: Local example of floating garden .................................................................................................... 57
96: Roof components ....................................................................................................................... 57
97: Roof top spaces ......................................................................................................................... 58
98: Thesis Presentation Board 1 ............................................................................................................. 59
99: Thesis Presentation Board 2 .......................................................................................................... 59
100: Thesis Presentation Board 3 ........................................................................................................ 60
101: Thesis Presentation Board 4 ....................................................................................................... 60
CHAPTER 1

THESIS INTENT

Bangladesh is a country of natural beauty and blessed with natural resources including very favorable livable climate. It is the country with world’s longest sea beach, largest Mangrove forest, formed as world’s largest delta by hundreds of rivers and their tributaries. Simultaneously, it is the country which is very much exposed to natural calamities. Overpopulation and unplanned development having major contribution towards the destruction of natural beauty and inviting frequent natural disasters to this poor developing country. Urban sprawl has caused the death of many rivers and extinction of forests without any concern for preserving existing ecosystem and implementing sustainable architecture. Bangladesh is known as a riverine country and the sources of all natural beauties are these rivers. In this thesis, I intend to focus on such architecture that respects the nature, establishes visual and physical communication with nature and reinforces the natural beauty of rivers instead of erecting prototype urban architecture adjacent to rivers.

Along with natural influence on architecture, the lifestyle, tradition and national identity of this country is also river-oriented as rivers play a vital role in Bangladesh’s evolution, existence, extinction, and survival. Hundreds of rivers and their tributaries are holding the small piece of land like a web and acting as the source of agriculture, transportation, occupation, food, electricity, beauty, tourism, and unique tradition. But as a result of urban sprawl, the developers are filling up wet lands and erecting concrete structures everywhere which results frequent floods and other disasters like collapse of buildings, crisis of supply water, pollution and extinction of certain species etc. In this scenario, this thesis would be the investigation for appropriate architecture with special consideration for building material and construction
system for particular sites near the river, architectural aesthetics which should emerge from rivers and river-based tradition and contribute to the community’s lifestyle as a whole.

Figure 1: Thesis Intent Diagram

**Thesis Objective**

- To establish Architecture that would reinforce the natural beauty of the particular land.
- To design in an appropriate way for a certain group of users.
- To integrate Architecture with Ecosystem, Tradition and Culture of that particular area.
- To implement appropriate material and construction system for river oriented architecture.
Figure 2: Thesis Objective Diagram
CHAPTER 2

RIVERS OF BANGLADESH

Figure 3: The Rivers & their tributaries

Rivers: Characteristic of Land

Special Characteristics of the land: The Rivers of Bangladesh get different look in different seasons. Some areas of the rivers get dry during the summer causing difficulties in transportation by revealing ‘Chars’(sandy land) and get inundated during Monsoon with high
velocity water rushing towards the sea and flooding surrounding lands.

Figure 4: River revealing land in summer

Rivers: In Origin & Existence

Most of the rivers originated in Himalayas and are discharged to Bay of Bengal creating Ganges, the largest delta in the world.

Figure 5: Himalayas: The origin of Ganges

Figure 6: Bay of Bengal: The discharge
**Rivers: As Source of Life**

Rivers are inseparable to the life of Bengali people. It is said that, Bengali people live on rice and fish and the source of both is river. Hence, a large number of inhabitants’ occupations are fishing, farming, sailing, making boats and other necessary elements related to these occupations.

**Rivers: In Regulating Life & Lifestyle**

Figure 7: Rivers in life and lifestyle

**Occupation**

Figure 8: Ship breaking yard in Chittagong
The Bengali people largely depend on water transportation like boats, launches, steamers etc. for transportation. They have been using water transportation for both passenger and goods.
Figure 12: Boats are common means of transportation in rural areas

**Tradition & Culture**

Traditional Boat Race is a popular sport in Bangladesh. The rural people have yearly occasion when a whole village is engaged in fishing from local lakes and bills and distribute the fishes among themselves. The whole village is flooded with joy and happiness of enjoying seasonal fresh fishes.

**Joy of life**

The hot humid climate is responsible for the integration of rural people and rivers. The rural children are ready to jump on the water at any time as a part of their entertainment.

Figure 13: Rural Children in rivers
Art & Craft

The use of local and sustainable materials like wood, jute fibers and bamboo are extensively used to produce the equipments and materials needed for fishing, sailing etc.

Figure 14: Fishing crafts in exhibition

Cultural Preservation

Rapid motorization of boats and the change of boat-building material – from wood to tin and welded steel sheets are ushering in an end to a magnificent heritage, changing the lives of families involved with this craft. It is a matter of great hope that great concern has been seen among the authority and general people to preserve our traditional river-based crafts and bring them out to the world. Several exhibitions have revealed the richness of natural beauty as well as the traditional crafts and reminded the world about the necessity of preserving them.

Beauty & Tourism

It is needless to say that, these rivers are the sources of the country’s natural beauty. The beauty of the rivers was revealed once again through the photographic exhibition ‘Pakhir Chokhe Bangladesh (Aerial View of Bangladesh)’ which showed very unusual and rare features of rivers that is impossible to see from ground level.
Rivers: In Devastation

Rivers are not only blessings for Bengali people. Land erosion and flood are also inseparable to this disaster-prone region, which washes away villages after villages every monsoon.
CHAPTER 3

EXISTING RIVERSIDE DEVELOPMENT

Being the capital of the country, Dhaka city with passage of time has been experiencing different faces of urban development. The city is famous for its 400 years old heritage, architecture, economic glory that flourished beside the river Buriganga in 17th Century during Mughal reign. It is a matter of shame that, Buriganga is now the most polluted and unpleasant river in the whole country due to the unplanned industrial growth of the city, overpopulation and excessive use of river as transportation. Although, back in history, the river bank was the most pleasant place for the entire city with proper setback from the river-facing palaces and other built areas. The Ahsan Manzil, Ruplal House, Lal Kuthi, Raghunath House, all these palaces are the only remaining spaces in old Dhaka, which have large setback from the river, raised river-facing platforms, grand descending stairs that provide the beautiful views of sailing boats, people walking on the band, and enjoying cool fresh breeze from the river.

The contemporary Dhaka city not only encroached the River Buriganga, but also extended so much towards north, east and west, that, other rivers surrounding the city as Balu river, Turag river are almost encroached by the developers and are dying due to urban sprawl. And this is the very common attitude of all the developing cities of the country. River banks are neither designed for recreation facilities, nor have proper definition that could limit the growth of the cities. Instead of spectacular Ruplal House or Ahsan Manjil, river banks and parts of rivers are being filled to accommodate high-rises as well as urban slums.
Figure 16: Ruplal House

Figure 17: Ahsan Manjil

Figure 18: Development beside Turag River

Figure 19: Riverside slum in Dhaka city
Water has been influencing architecture since the beginning of human civilization. Architecture near a natural water source or designing artificial water bodies in or around architecture have been practiced not only for climatic, comfort, security or circulation facilities, but also to a great extent for mental and visual pleasure and aesthetics, to create a grand gesture in architecture. Reflection plays a vital role in enhancing the beauty of architecture by creating dramatic environments. The concept of aesthetics from reflection on water can lead to various other interesting ideas including using other transparent or reflective materials that would help to enhance the beauty of architecture too. The way nature (water) reflects architecture, in the same way; architecture can also reflect nature and become a part of natural environment instead of being a sharp interruption in peaceful and calm natural setting.

Figure 20: Reflection of Sheikh Zayed Grand Mosque in Abu Dhabi
Integration of Architecture, human and water

Architecture can provoke, inspire human mind to rush towards nature, natural element. The best way architecture can represent a nation has been expressed very dramatically and aesthetically as well as metaphorically in National Opera House, Oslo. In order to establish a
national symbol, the architect group Snohetta chose the form of Opera House by abstracting iceberg (a symbol for Norway), which gradually descends to Bjørvika Peninsula. The inclined plaza draws people from all surrounding areas and leads towards the water.

![Figure 24: National Opera & Ballet in Oslo](image)

**In Land Construction**

Some urban developments are completely guided by water or river, as, in Delta country, Holland, where 26% of land is below water level. In order to protect the country, dikes have been constructed which resulted with very unusual and interesting views of sailboats sailing above eye level.

![Figure 25: Dike construction in Holland](image)

**Edge Construction**

Pirrama Park, Sydney’s waterfront park is a transformative urban parkland project. The park creates recreation opportunities along the waterfront, offering the opportunity to step
down and engage with the water. The park can accommodate a range of public uses including cultural events and performances, meetings, markets, festivals, appropriate to the evolving urbanity of the area.

Figure 26: Pirrama Park, Landscape design by Aspect Studios

**Thesis Development Phase-1**

Figure 27: Thesis Development Diagram-Phase 1
CHAPTER 5

PRECEDENT STUDY

The Randers Museum of Art

The Randers Museum of Art has been proposed for Denmark, in the city Randers, in a scenic location by Gudena River. The Danish architect group 3XN’s first prize proposal depicts a nice concept of blending art, architecture and the context as elements of exhibitions in human life. The building is itself a sculpture located in its own sculpture park.

**Concept:** the new Randers Museum of Art is a building where nature is drawn in and art reaches out. The key idea behind the design is that a good, well functioning museum is extrovert and opens up towards its surroundings inviting visitors, as well as introvert in its concentration on the experience of the works of art within it. A good museum is a vibrant part of its local surroundings – as well as a unique framework for the unique works of art it displays. The objective of this project is to create a connection between the art, the nature and of course the community.

**Architecture:** The museum consists of a building on one level, rising up towards each end and traversed by a diagonal with a mezzanine deck running full length through the exhibition building. This diagonal creates a bridge between the permanent exhibition and the temporary exhibition. As such, the internal flow is a continuation of the external flow of its surroundings – the city of Randers and the scenic location by the river. Architecturally an expression of coherence is achieved through this soft transition of the exterior and the interior. The semi glazed tile facade becomes the roof, and similarly – inside – the floor becomes a wall, and the wall a ceiling. The Museum will house three exhibition galleries, an auditorium, cafe, boutique and a range of administrative facilities. The main exhibition gallery will house the Museum’s
considerable collection of Danish art – directly connected to the landscape depicted in so many of its works. The temporary exhibition space balances the national emphasis with its international potential

Context: Randers Museum of Art will be a prominent new landmark at the entrance to the town of Randers and alongside the Guden River. It would be a transition point between town and landscape, art and nature. Opening up at one end towards the town – and at the other towards the landscape; the Museum will merge these two concepts through the experience of the works of art within it. The building also merges tradition and innovation incorporating the long Danish tradition of building beautiful and durable buildings in materials taken from the earth on which they are built.

Figure 28: Randers Museum, site Context

Figure 29: Randers Museum, Sculpture Garden
Figure 30: Randers Museum, reflection on water

Diagram:

Figure 31: Randers Museum, Relationship Diagram
**Natalie Jeremijenko ’s Ooz (Zoo)**

Natalie Jeremijenko’s proposed zoo on Hudson River is an exceptional idea for Amphibious Architecture which explores reciprocity in the zoo. Natalie’s work primarily explores the interface between society, the environment and technology. This zoo is a place where animals and human interacts, a zoo without cage, where animals remain by choice.

**Human-Animal interaction:** Architecture of Reciprocity: Any action one person directs at the animal, they can direct at the person in same way. Information Architecture: Architecture of collective observation and interpretation.

**Site: Hudson River, NY:** The site for this interacting zoo has been proposed on an existing abandoned pier on Hudson River. There has already been an ecosystem existing which could be experimented easily and it also allows a perfect condition for the proposed animal-human interaction. Moreover, the area would be reactivated with the introduction of the zoo.

**The new structure would include the following interfaces:**

- **Submerged fish restaurants:** Races for feeding the fish, not eating them. One-way valves would facilitate that through which people can push a food offering.
- **Water pressure exhibits:** The walls would be designed with flexible and moveable parts that are filled by the water pressure and dynamic flow of the river. Of various volumes, people can push against these to test their strength against the river.
- **Fish petting:** Including long rubber gloves, there would be water tunnels cutting through the human space that can provide short cuts for the fish.
- Above water displays: The display of flow direction and bird architecture with safe nesting areas.
- Transparent information walls: Would show different water levels; water quality; water temperature.
- Surface interactions: The interaction with water striders and other surface creatures.

Figure 32: Natalie Jeremijenko’s proposed zoo

Figure 33: The proposed zoo on existing piers of Hudson River

Figure 34: Basic Components of zoo
**Technological Interface:** The project incorporates various technological interfaces to facilitate interaction with natural systems as opposed to virtual systems. These interfaces encourage interactive relationships with non-human. They are intended to accumulate the actions of participants into productive local environmental knowledge and the remediation of urban territories.

This project is a nice way of responding towards nature and ecosystem through architecture. Although there is not enough information about the exact materials used for the walls, the flexibility of the walls allows interacting with water, which is very interesting. There are provisions for accommodating certain species like fish, bird and water striders etc.

**Diagram:**

![Relationship Diagram](image)

Figure 35: Relationship Diagram
Jean Marie Tjibaou Cultural Center

Location: The Tjibaou Cultural Center designed by Architect Renzo Piano is devoted to the cultural origins and search for identity of the native Kanak people of New Caledonia and the South Pacific. It is dedicated to Jean-Marie Tjibaou who died in 1989 while leading the fight for his country’s autonomy from the French government.

Nature: The strong integration of Kanak community with nature has been inspired by this design. The form of indigenous huts blended with the nature as they have series of indoor and outdoor spaces with flexible functions. Located on a peninsula between the storm-tossed Pacific Ocean and a calm lagoon the design of Renzo Piano takes advantage of the prevailing winds from the ocean side through its system of natural ventilation. The sound and feel of the wind is something that can only be experienced by being there and seems to transcend any kind of technological terms or mechanisms. It is a feeling of being inside, yet outside at the same time; of being protected yet still close to nature.

The relationship of the Kanak culture to nature and the landscape is reinforced by a Kanak pathway which winds through the dense natural vegetation, traditional ceremonial grounds of the Kanak with traditional huts, an outdoor auditorium and residences for visiting artists, lecturers, scholars and students. These spaces, as well as the main building, integrate themselves and take advantage of the natural beauty of the site.

Culture: The Cultural Center is composed of three ‘villages’ made up of ten ‘Great Houses’ of varying sizes and functions and a central alley along which the huts are dispersed. The huts house individual functions such as exhibition spaces, multimedia library, cafeteria, and conference and lecture rooms. These ‘Great Houses’ are linked by a long, gently curving enclosed walkway, reminiscent of the ceremonial alley of the traditional Kanak village.
Material & construction technology: The walls are made of indigenous wood much like the huts that the indigenous people make to live in. Horizontal wood slats composed of Iroko wood (a type of wood that is impervious to rot and can withstand cyclone-force winds) of the outer facade on the ocean side filter the wind into a second layer of skin, an inner facade of glass louvers which open or close according to wind speed, allowing wind to flow through the building for passive ventilation. The double layer of skin also filters the warm air upward functioning similar to a chimney. The new age construction technologies mixed with the traditions of the indigenous tribe of Noumea of New Caledonia, Kanak. The complex is created for people that actually need the buildings. The buildings can reflect the style of the people who actually inhabit the space.

Figure 36: Conceptual sketch by Renzo Piano

Figure 37: Gallery Space
Figure 38: Site Context

Figure 39: Circulation spaces

Diagram:

Figure 40: Relationship Diagram
THESIS

Natural force

- Land
  - Water

- Aesthetic
- Program
- Users
- Space Quality

Tradition

- Lifestyle
  - Identity

- Communication
- Occupation
- Relaxation
- Art & Craft
- Sport

Environment

- Ecosystem

- Material
- Geography
- Evolution
- Survival
- Extinction
- Living Being

Architecture

Figure 41: Thesis Development Diagram-Phase 2
CHAPTER 6
THE SITE

A riverfront site located to the west of River Karnaphuli in Chittagong city of Bangladesh is proposed for recreational development by the Chittagong Development Authority. The site is at the edge of the second largest city of the country which has a complex semi urban development pattern with fishermen colonies, factories and industries, Chittagong sea port, open lands and continuous river views. The river bank of the entire district experiences tidal flood twice a day due to its close location to the river’s estuary where the river gets discharged to the ocean. A marine drive has been proposed by CDA along the bank of the river in order to facilitate tourism and also to protect the area from tidal and flash flood. That also poses a threat to the existing ecosystem and lifestyle of fishermen and their relationship with river.

Location

Figure 42: Chittagong City in Bangladesh
Site Surrounding

The entire riverbank of Karnaphuli has several river deltas which are known locally as ‘Char’ areas. These river deltas or Chars are usually full of tidal creeks which facilitate the entire Char to experience different water level in different period of day and year. The proposed site is such a river delta. The site is bounded by navigational creeks and separated from the main land by those creeks. There is a fishermen colony to the west of the site and the river Karnaphuli is to its east. There are three bridges near the site to cross the river and create continuous connection with the surrounding regions. These are Kalurghat Bridge, 3rd Karnaphuli Bridge and Shah Amanat Bridge. There is also a small launch Terminal and Railway station known as Jainal Hat Railway Station in this area.

Figure 43: Proposed site & its surrounding
Communication & Circulation

Figure 44: Third Kanaphuli Bridge

Figure 45: Old Kalurghat Bridge

Figure 46: Access to the site by boat
Land Use Pattern

The project is owned by Chittagong Development Authority (CDA), Water Development Board, PWD and private sector NGO’s. The entire riverbank is proposed by CDA as a Marine Drive and there would be several parks and recreational developments to encourage tourism in this area. The designated site is proposed for a recreational development.
Figure 48: Proposed land use plan of DPZ-04 (Bakalia-Chandgaon)

Site Images

Figure 49: Site Panoramic View 1

Figure 50: Site Panoramic View 2
Special Characteristic: Tidal Creeks

The entire site is a 251 acre swamp grassy land, criss-crossed by tidal creeks. The site is only 2m high from the sea level and slightly sloped towards the river. The creeks perform as drainage system for the main land in monsoon. Some of the creeks including the bounding creeks are navigational and all of them overflow in monsoon and also in daily tidal effect. The combined effect of the heavy monsoon and high tide may inundate the entire site under 6-8’ of water.
Figure 53: Navigational Creek

Figure 54: Navigational Creeks in site

Figure 55: The Mouth of Creek from river

Figure 56: Swamp grass
Climate

The climate of the country is subtropical monsoon climate. Moderate temperature (10° to 38° C) difference throughout the year, heavy rainfall and high humidity are main characteristics of the country’s climate. Heavy rainfall is one of the most significant features of Bangladesh’s climate. About 80% of yearly rain falls during monsoon which is followed by heavy gusts and storms in the beginning of summer. Wind flow is from North and North-West in winter and the summer wind is directed from South East, Channeled from Indian Ocean, being a great relief from the hot and humid summer.
**Floods in different season**

The site remains mostly dry and grassy during the winter with few navigational creeks. Due to tidal effect, the creeks start to bleed daily twice and inundate partially the low areas according to high or low tide. In monsoon, the tidal flood is accompanied by monsoon flash flood which chronologically floods the entire site. In 1991, the entire district was flooded due to juxtaposition of excessive rainfall and high tide.

Figure 59: Effect of tidal flood and monsoon flood
I propose a River research center which would act more like a River interpretation center, as scientists and fishermen and the general people would get the chance to share all the knowledge about rivers’ importance in the countries existence and our responsibility to rivers and nature. The entire project would be a place for celebration of nature, especially rivers providing educational and recreational facilities.

**Built Area**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research on River</td>
<td>22,000</td>
</tr>
<tr>
<td>Library</td>
<td>8000</td>
</tr>
<tr>
<td>Seminar Rooms</td>
<td>1800</td>
</tr>
<tr>
<td>Laboratories</td>
<td>3000</td>
</tr>
<tr>
<td>Lecture Halls</td>
<td>1200</td>
</tr>
<tr>
<td>Multipurpose Halls</td>
<td>8000</td>
</tr>
<tr>
<td>Administration</td>
<td>3000</td>
</tr>
<tr>
<td>Office Areas</td>
<td></td>
</tr>
<tr>
<td>Service Areas</td>
<td></td>
</tr>
<tr>
<td>Exhibition</td>
<td>5000</td>
</tr>
<tr>
<td>Galleries</td>
<td>4500</td>
</tr>
<tr>
<td>Outdoor Exhibition spaces</td>
<td></td>
</tr>
<tr>
<td>Souvenir Shop</td>
<td>500</td>
</tr>
</tbody>
</table>
Restaurant 3000 sft

Total 33000 sft

Circulation (30%) = 33,000 * .3 = 9,900 sft

Total 42,900 sft

Outdoor Recreation Facilities

Water Sport Facilities
Boating Activities
Water recreational facilities
River view gallery

Laboratories

- Cultural & Historical: Protection and regeneration of the previous sustainable culture and heritage, reintroduction of them in modern culture and period.
- Ecological Research: Research on Flora, Fauna, different species of fishes and aquatic animals.
- Naval Architecture: Study on Navigation & reintroduction of the traditional sustainable boat architectures, encouraging uses of traditional fishing traps, making them more modern and durable.
- Eco-Tourism: Ensuring proper location of eco-tourist spots and improvement of accessibilities, establishing guidelines for protection of natural resources, documentation and publication etc.
- Resources: Proper utilization of natural resources in agriculture, hydropower, transportation, etc.
• Hydro-chemistry: Research on salinity, fresh water, water quality, pollution etc.

• Anthropology: Research on the change of river course, causes, time period, effects on environment and human settlement, etc.

• Archeology: Research on different types of Lands, utilization of sediments, preservation of water body etc.

• Workshops: Experiments and life scale model making.

• Photographic Studio: Documentation and preservation
CHAPTER 8
BUILDIGN SYSTEM RESEARCH

**Structural**

**Float House in New Orleans**: The house’s chassis acts as a raft, guided by steel masts, rises the whole house 12’ with the rise of water.

![Figure 60: Float House in New Orleans by Morphosis Architects](image)

**Rain Water Storage System**

**Magney House, Glenn Murcutt**: The shape of the roof has been designed to facilitate rain water collection and storing in water tanks.

![Figure 62: Rain water storage system of Magney House](image)
Material: Vernacular Architecture

Handmade School in Dinajpur, Bangladesh: This school is a great example of blending tradition to local techniques into modern architecture. Local material like mud has been strengthened by adding straw which introduces a new and more durable building material, named rammed earth. And bamboo which is very plenty in the region, has been used extensively as structural element.

Construction Technique: Anta- Fish Trap

The construction techniques of local fish traps are very unique and interesting. The traps are made of bamboo sticks and the sticks are tied with special plant fibers. The fibers are tied in such a way that they create a series of loops around the sticks and give the whole surface
flexibility of forming different shapes and also create nice perforation to allow wind, water and light to pass through the fish trap.

Figure 65: Construction technique of local fish trap - Anta

**Local Precedent Study: Nishorgo Oirabot Nature Interpretation Center**

Located in a protected forest and natural reserve in Teknaf, Bangladesh, the project aims to create awareness and promote biodiversity, conservation and eco-tourism. In order to see the surroundings, a raised platform has been created for the visitors. The entire building has been placed on the site gently giving light and floating characters. A very sensitive attitude has been shown towards nature by piercing the concrete roof, to allow the trees to grow, so that, least impact is posed to nature and environment.

Figure 66: Nishorgo Oirabot Nature Interpretation Center designed by Vitti Architects, Bangladesh
Final Design Development

Figure 67: Design Development Diagram-Final Phase
CHAPTER 9

DESIGN PROPOSAL

Design concept

The traditional boats of Bangladesh are always fascinating due to their craftsmanship, space quality, their closeness to nature, the power of integrating human life with rivers and nature. As my intention was to represent the unique features of tradition, culture and nature into architecture, I started from abstracting the traditional boats and stacking a bunch of linear platforms with floating characters and a shell which provides controlled shade to the platforms and creates nice outdoor spaces from where nature and rain could be enjoyed. The shading is designed according to the construction techniques of local fish traps to take advantage of the richness of traditional crafts. Since the site gets affected by the tidal flood daily and there are tidal creeks in the site, the entire site may go under 6-8’ of water during high tide and severe flash flood. In order to adopt to this situation, I raised the entire building 25’ high from the ground and created open floating platforms on the ground to ensure accessibility at any time (during Tide & Webb) by boat or by walkways that connect the building with the main land. The public spaces are designed to offer different kinds of visual experience of rivers and the rooftop is designed as accessible gardens for public and partially for harvesting rainwater. Some features like floating gardens, rainwater storage system, floating restaurants and floating platforms and pathways have been proposed to the design which could suggest the experimental but surviving ways for disaster and specially flood-prone countries like Bangladesh.

Figure 68: Concept Diagram
Figure 69: Concept Diagram

A floating linear box

Rise of platform with water level rise creates great impact on upper floors

Connection and movement by flexible ramps

Variation of floor plates as floating and fixed platforms

Connection and movement starts to break down the box
The impact of moving platform inspires to increase views by undulating different floors

Rotation of the building facilitates summer wind ensures greater exposure of river

Breaking down the box into platform resembles stacking of traditional boats

Connection with main land by a floating path

Water transportation

Uninterrupted view towards river

Floating urban recreation area

Connection with green ground

Figure 70: Concept Diagrams
Preliminary Design

Figure 71: Conceptual Sketch

Figure 72: Preliminary study model

Figure 73: Design development model
Final Design Documentation

Figure 74: Aerial View

Figure 75: View from the floating walkway
Figure 76: View from Karnaphuli River

Figure 77: View of floating deck from the floating garden
Figure 78: View from Karnaphuli River

Figure 79: Interior Common space
There is an existing partial temporary embankment to the east end of the site which does not protect the site from flood, instead, creates a complex situation for drainage in monsoon. The proposed marine drive would create a strong boundary between the river and the tidal basins which would ultimately affect the long established natural systems of that district. Also, the local inhabitants especially the fishermen colony has a strong relationship with the river and their lifestyle which would also be disturbed to a great extent. So, I proposed a raised expressway to the west of the site which would facilitate the circulation as well as maintain the existing relationship of fishermen colony with site and river. A visitor center including drop off and parking facilities are proposed at the west edge of the site from where boating services and continuous walkways to the research and recreation center would be available. This welcome center is proposed to be connected with the elevated expressway as well as surface roads and pedestrians. The both sides of the site bounding creek would be designed as parks as an intermediate semi-urban recreation
space between the research center and the locality. The built form of the research and recreation center would create least impact on the site and would be accessed by boats any time (in dry season and flood) from the river and canals and the access walkway is designed as partially floating, partially raised and bridged on the creeks to allow the boats to pass underneath it. There would be several resting places with seating arrangements and views of floating gardens connected to the walkway.

Figure 81: Site plan
Figure 82: First Floor Plan

Figure 83: Plans
Figure 84: Types of Platform

Figure 85: Section through research area

Figure 86: Transverse Section

Figure 87: Section through Library & Gallery
Figure 88: Platforms

Figure 89: Shell

Figure 90: Special relationship
Details

Floating Deck Mechanism

Figure 91: Movement of floating deck with rise of water
Rain Water Collection System

Figure 92: Floating and inundated platforms

Figure 93: Diagram of Rainwater collection system

Figure 94: Floating ramp detail
Floating Garden Detail

Figure 95: Local example of floating garden

Roof Detail

Figure 96: Roof components
Figure 97: Roof top spaces
Thesis Presentation Boards

Figure 98: Thesis Presentation Board 1

Figure 99: Thesis Presentation Board 2
Figure 100: Thesis Presentation Board 3

Figure 101: Thesis Presentation Board 4
BIBLIOGRAPHY


Betsy, Aaron. *Landscrapers:* Building with the land.


http://www.banglapedia.org/httpdocs/HT/C_0220.HTM

http://www.thedailystar.net/magazine/2004/10/04/cover.htm


http://www.thedailystar.net/magazine/2005/03/03/reflections.htm